International Journal of Engineering Science

List of Contents and Author Index

Volume 29, 1991

PERGAMON PRESS

OXFORD · NEW YORK · SEOUL · TOKYO

ES 29:12-M

INTERNATIONAL JOURNAL OF ENGINEERING SCIENCE

Incorporating: *Letters in Applied and Engineering Sciences*

Board of Editors

Editor-in-Chief: Dr A. CEMAL ERINGEN, *International Journal of Engineering Science*, 129 Broadmead Street, Princeton, NJ 08540-7201, U.S.A.

Assistant to the Editor: M. GIANCOLA

Associate Editors

Professor E. S. ŞUHUBİ, Istanbul Teknik Universitesi, Fen-Edebiyat Fakultesi, Muhendislik Bilimleri Bolumu, 80626 Maslak—Istanbul, Turkey

Professor J. T. ODEN, Department of Aerospace Engineering and Engineering Mechanics, The University of Texas at Austin, Austin, TX 78712, U.S.A.

Honorary Members

Professor I. N. SNEDDON, Department of Mathematics, University of Glasgow, Scotland

Professor S.-I. PAI, Institute for Physical Science and Technology, Department of Aerospace Engineering, University of Maryland, College Park, MD 20742, U.S.A.

Editorial Advisory Board

S.-I. AMARI, *Japan*
S. A. BERGER, *Berkeley, CA*
B. A. BILBY, *Sheffield*
S. R. BODNER, *Israel*
H. DEMIRAY, *Turkey*
D. G. B. EDELEN, *Bethlehem, PA*
J. HUTCHINSON, *Cambridge, MA*
H. KARDESTUNCER, *Storrs, CT*
K. KONDO, *Tokyo*
F. KOZIN, *New York*
E. KRÖNER, *Stuttgart*
G. MAUGIN, *France*
S. MINAGAWA, *Japan*
T. MURA, *Evanston, IL*
F. R. N. NABARRO, *Johannesburg, South Africa*
P. M. NAGHDI, *Berkeley, CA*
J. T. ODEN, *TX*
R. W. OGDEN, *Glasgow*
Z. OLESIAK, *Warsaw*
S.-I. PAI, *College Park, MD*
S. B. POPE, *New York*
I. PRIGOGINE, *Brussels*
K. A. RACHMATULIN, *Moscow*
K. R. RAJAGOPAL, *Pittsburgh, PA*
G. F. SMITH, *PA*
E. SOÓS, *Bucharest*
A. J. M. SPENCER, *Nottingham*
C. SPEZIALE, *Hampton, VA*
I. STAKGOLD, *DE*
E. S. ŞUHUBİ, *Istanbul*
T. W. TING, *Urbana, IL*
C. WEI-ZANG, *China*

Publishing Office: Pergamon Press plc, Pergamon House, Bampfylde Street, Exeter EX1 2AH, England (*Tel.* Exeter (0392) 51558; *Fax* (0392) 425370). *Subscription and Advertising Offices:* Pergamon Press plc, Headington Hill Hall, Oxford OX3 0BW, England (*Tel.* (0865) 794141); Pergamon Press Inc., 395 Saw Mill River Road, Elmsford, NY 10523, U.S.A.

Subscription Rates: Annual institutional subscription rate (1992): £665.00 (US$1065.00). Two-year institutional rate (1992/93): £1263.50 (US$2023.50). Sterling prices are definitive. US dollar prices are quoted for convenience only, and are subject to exchange rate fluctuation. Prices include postage and insurance and are subject to change without notice. Subscription rates for Japan are available on request.

Back Issues: Back issues of all previously published volumes, in both hard copy and on microform are available direct from Pergamon Press offices.

Published monthly.

Copyright © 1991 Pergamon Press plc

It is a condition of publication that manuscripts submitted to this journal have not been published and will not be simultaneously submitted or published elsewhere. By submitting a manuscript, the authors agree that the copyright for their article is transferred to the publisher if and when the article is accepted for publication. However, assignment of copyright is not required from authors who work for organizations which do not permit such assignment. The copyright covers the exclusive rights to reproduce and distribute the article, including reprints, photographic reproductions, microform or any other reproductions of similar nature and translations. No part of this publication may be reproduced, stored in a retrieval system or transmitted in any form or by any means, electronic, electrostatic, magnetic tape, mechanical, photocopying, recording or otherwise, without permission in writing from the copyright holder.

Whilst every effort is made by the publishers and editorial board to see that no inaccurate or misleading data, opinion or statement appears in this journal, they wish to make it clear that the data and opinions appearing in the articles and advertisements herein are the sole responsibility of the contributor or advertiser concerned. Accordingly, the publishers, the editorial board and editors and their respective employees, officers and agents accept no responsibility or liability whatsoever for the consequences of any such inaccurate or misleading data, opinion or statement.

PHOTOCOPYING INFORMATION FOR USERS IN THE U.S.A.

The Item-Fee Code for this publication indicates that authorization to photocopy items for internal or personal use is granted by the copyright holder for libraries and other users registered with the Copyright Clearance Center (CCC) Transactional Reporting Service provided the stated fee for copying beyond that permitted by Section 107 or 108 of the United States Copyright Law is paid. The appropriate remittance of $3.00 per copy per article is paid directly to the Copyright Clearance Center Inc., 27 Congress Street, Salem, MA 01970. The copyright owner's consent does not extend to copying for general distribution, for promotion, for creating new works, or for resale. Specific written permission must be obtained from the publisher for such copying. *The Item-Fee Code for this publication is*: 0020-7225/91 $3.00 + 0.00

⊗™ The paper used in this publication meets the minimum requirements of American National Standard for Information Sciences—Permanence of Paper for Printed Library Materials, ANSI Z39.48-1984.

List of Contents

NUMBER 1

R. Y. S. Pak and **J.-D. M. Saphores**	1	Torsion of a rigid disc in a half-space
J. G. Michopoulos and **P. S. Theocaris**	13	The directional instability of the running crack: a deterministic and stochastic approach
Yu. Z. Povstenko	37	Connection between non-metric differential geometry and mathematical theory of imperfections
Hilmi Demiray and **Raymond P. Vito**	47	A layered cylindrical shell model for an aorta
Robert M. Terrill and **Tracy Colgan**	55	Some simple analytic solutions of the Navier–Stokes equations
Janusz Badur	69	Extension of many-time Hamiltonian formalism to the theory of deformable bodies
K. M. Deng, Z. X. He, C. W. Lung, K. L. Wang and **J. L. Yang**	79	A new gauge field theory of a continuum with dislocations and disclinations
T. Bryant Moodie	87	Wave solutions for variable loading of cavities in inhomogeneous plates
A. Osman Çakiroğlu and **Fevzi L. Çakiroğlu**	99	Continuous and discontinuous contact problems for strips on an elastic semi-infinite plane
P. Chaturani and **V. Palanisamy**	113	Pulsatile flow of blood with periodic body acceleration
S. Kishore Kumar and **L. V. K. V. Sarma**	123	Fluid–particle suspension flow past a stretching sheet
E. S. Şuhubi	133	Isovector fields and similarity solutions for general balance equations
	151	Announcement
	I	Software Survey Section

NUMBER 2

Yishi Duan and **Shengli Zhang**	153	Topological structure of disclinations in the gauge field theory of dislocation and disclination continuum
Zhanjun Gao and **Toshio Mura**	161	Transformation toughening in ceramic with martensites or micro-cracks
H. G. Georgiadis, P. S. Theocaris and **S. C. Mouskos**	171	Plane impact of a cracked viscoelastic body

Akhlesh Lakhtakia, Vijay K. Varadan and **Vasundara V. Varadan** 179 Surface integral equations for scattering by PEC scatterers in isotropic chiral media

T. Omar and **Hassan A. Z. Hassan** 187 Approximate solution for an indentation problem using dual series equations

W. Wu and **Z. Sikora** 195 Localized bifurcation in hypoplasticity

A. Ertepinar 203 Compressible, hyperelastic spinning tubes subjected to circumferential shear

H. Ramkissoon, C. V. Easwaran and **S. R. Majumdar** 215 Longitudinal and torsional oscillation of a rod in a polar fluid

J. M. Golden and **G. A. C. Graham** 223 Asymmetric steady-state solutions for a crack in a viscoelastic field of pure bending

Wu Zhang, Shijun Luo and **Peiye Zhu** 237 Numerical simulation of vortex breakdown onset

G. A. Maugin and **S. Cadet** 243 Existence of solitary waves in martensitic alloys

I Software Survey Section

NUMBER 3

IVTH SYMPOSIUM ON COUPLED FIELDS: THEORY AND APPLICATIONS (NEAR-SURFACE PHENOMENA)

Guest Editors: J. KAPELEWSKI and G. A. MAUGIN

v Foreword

E. Akçakaya 259 Coupled mode analysis of SAW transducers

L. A. Chernozatonskii, S. N. Ermoshin and **D. K. Gramotnev** 265 Anomalous absorption of spatial shear waves by a thin layer of viscous liquid

V. I. Gorentsveig, Yu. S. Kivshar, A. M. Kosevich and **E. S. Syrkin** 271 Nonlinear surface modes in crystals

Y. Hiki, Y. Kogure, H. Nakamura and **K. Kawasaki** 281 Scattering of phonons by fine particles

J. Kapelewski and **J. Michalec** 285 Soliton-like SAW in nonlinear isotropic piezoelectrics

J. Kapelewski and **L. Solarz** 293 Modeling of a surface wave reflection at a thin semiconducting layer

P. J. Kiełczyński and **G. A. Maugin**	305	Group and energy velocities of SH surface waves propagating around a stratified piezoelectric cylinder
S. Kojima	309	Reflection acoustic microscopy to crystalline materials
M. Košek	317	Investigation of some second order effects in SAW devices
A. M. Kosevich, M. L. Polyakov and **E. S. Syrkin**	323	Vibrational states in a semi-infinite crystal with local defects
Yu. A. Kosevich	327	Nonlinear shear surface waves at the interfaces and planar defects of crystals
E. Langer	331	Fundamental analysis of surface acoustic wave propagation
W. Ludwig	345	Dynamics at crystal surfaces, surface phonons
A. Z. Maksymowicz	363	Coupling of elastic and magnetic longitudinal modes in amorphous ribbons
S. Mase	367	Some second order transition-like anomaly in ultrasonic attenuation in semimetals at low temperatures and high magnetic fields
G. A. Maugin and **H. Hadouaj**	375	Nonlinear surface transverse waves (STW) on elastic structures
S. Nakashima and **K. Mizoguchi**	381	Structure analysis of semiconductor surfaces and films by Raman scattering technique
M. Okuyama and **Y. Hamakawa**	391	Ferroelectric $PbTiO_3$ thin films and their application
L. Spassov	401	Some investigations on piezoelectric quartz resonators
E. S. Syrkin	407	Dynamical characteristics of subsurface local defects in highly anisotropic crystals
V. A. Vyun and **I. B. Yakovkin**	411	Nonlinear acoustoelectronic phenomena in layered structures
	I	Software Survey Section

NUMBER 4

F. Dai, K. R. Rajagopal and **A. S. Wineman**	419	Diffusion through non-linear orthotropic cylinders
H. A. Erbay and **E. S. Şuhubi**	447	An asymptotic theory of thin hyperelastic plates—I. General theory

H. A. Erbay and E. S. Şuhubi 467 An asymptotic theory of thin hyperelastic plates—II. Incompressible solids and an application of the general theory

Ch. Zhang 481 Reflection and transmission of SH wave by a periodic array of interface cracks

Anders Klarbring 493 Derivation of a model of adhesively bonded joints by the asymptotic expansion method

Muhammad Aslam Noor and S. I. A. Tirmizi 513 Numerical methods for a class of contact problems

M. Torrisi and S. Lombardo 523 Similarity solutions of the Wood–Kirkwood model in detonation theory

533 Announcement

I Software Survey Section

NUMBER 5

R. O. C. Guedes and R. M. Cotta 535 Periodic laminar forced convection within ducts including wall heat conduction effects

C. Făciu and M. Mihăilescu-Suliciu 549 Convex and non-convex energy in three-dimensional rate-type semilinear viscoelasticity

A. C. Hansen, R. L. Crane, M. H. Damson, R. P. Donovan, D. T. Horning and J. L. Walker 561 Some notes on a volume fraction mixture theory and a comparison with the kinetic theory of gases

Hilmi Demiray and Ali Ercengiz 575 Wave propagation in a prestressed elastic tube filled with a viscous fluid

Fouad A. Mohamed 587 Determination of an unknown function in parabolic problems with standard and non-standard boundary data

Dimitris C. Lagoudas 597 A gauge theory of damage

S. Thangam and N. Hur 607 A highly-resolved numerical study of turbulent separated flow past a backward-facing step

Y. B. Fu and N. H. Scott 617 The transition from acceleration wave to shock wave

M. Errafiy and R. Kh. Zeytounian 625 The Bénard problem for deep convection: linear theory

M. A. Mansour, I. A. Hassanien and Rama Subba Reddy Gorla 637 Effect of suction/injection on the free convective heat transfer in a micropolar fluid from a nonisothermal flat plate under non-uniform gravity

Letters in Applied and Engineering Sciences

Giuseppe Saccomandi 645 Group properties and invariant solutions of plane micropolar flows

I Software Survey Section

NUMBER 6

G. Johnson, M. Massoudi and K. R. Rajagopal 649 Flow of a fluid infused with solid particles through a pipe

B. N. Mandal and N. K. Ghosh 663 Ring source potential outside a vertical co-axial circular cylinder in a liquid of finite depth with an inertial surface

L. Librescu and R. Schmidt 669 Substantiation of a shear-deformable theory of anisotropic composite laminated shells accounting for the interlaminae continuity conditions

Zhanjun Gao and Toshio Mura 685 Elasticity problems with partially overspecified boundary conditions

A. K. Jaiswal, T. Sundararajan and R. P. Chhabra 693 Hydrodynamics of Newtonian fluid flow through assemblages of rigid spherical particles in intermediate Reynolds number regime

E. Smith 709 The use of eta factors to describe the plastic contribution to the J-integral

E. Smith 717 The plastic component of the deformation J-integral for a stationary crack: the small-scale yielding situation

C. Atkinson and C. Bastero 727 On the use of Betti's reciprocal theorem for computing the coefficients of stress singularities in anisotropic media

George Mathew and M. J. Vedan 743 Generalized hydromechanical variational principle and Noether's second theorem

A. Klarbring, A. Mikelić and M. Shillor 751 The rigid punch problem with friction

Jean-Marie Segura 769 Effects of "warping variation" on the evaluation of axial and shear stresses in straight beams subject to flexure

783 Announcements

I Software Survey Section

NUMBER 7

J. L. Auriault 785 Heterogeneous medium. Is an equivalent macroscopic description possible?

Ronald L. Bagley	797	The thermorheologically complex material
C. Giorgi and **A. Morro**	807	Extremum principles for viscoelastic fluids
Hyung Jip Choi and **Surot Thangjitham**	819	Heat conduction in laminated anisotropic composites with a debonding
E. Inan and **A. C. Eringen**	831	Nonlocal theory of wave propagation in thermoelastic plates
S. Erbay, H. A. Erbay and **S. Dost**	845	Nonlinear wave modulation in micropolar elastic media—I. Longitudinal waves
H. A. Erbay, S. Erbay and **S. Dost**	859	Nonlinear wave modulation in micropolar elastic media—II. Transverse waves
F. van Keulen	869	A bound on the error in classical theory of laminated plates
J. Kaczmarek	883	Stress–strain relation for materials which undergo two-path stress-induced displacive phase transition
	I	Software Survey Section

NUMBER 8

Q. Jiang and **R. K. N. D. Rajapakse**	889	A boundary integral equation formulation for coupled heat–moisture transfer in porous media
M. Touratier	901	An efficient standard plate theory
Fadil Santosa and **Michael Vogelius**	917	A computational algorithm to determine cracks from electrostatic boundary measurements
A. L. Ting, J. S. Walker, T. J. Moon, C. B. Reed and **B. F. Picologlou**	939	Linear stability analysis for high-velocity boundary layers in liquid-metal magnetohydrodynamic flows
R. C. Batra and **C. H. Kim**	949	Effect of thermal conductivity on the initiation, growth and bandwidth of adiabatic shear bands
G. A. Rogerson	961	A multi-constrained elastic wave problem
J. N. Flavin	969	Some connections between velocity-related and pressure-related quantities in axisymmetric fluid flow
F. A. Mohamed	973	Recovery of an unknown function in hyperbolic problems with standard and non-standard boundary data
A. P. Harvey and **G. E. Tupholme**	987	Nonlinear mode coupling of two co-directional surface acoustic waves on a piezoelectric solid
A. P. Mayer	999	Evolution equation for nonlinear Bleustein–Gulyaev waves

Y. Kohno and **H. Ishikawa** 1005 Singular stress and displacement fields around the corner point of a fiber end in short fiber reinforced composites

Letters in Applied and Engineering Sciences

S. K. Ghosh 1013 A note on steady and unsteady hydromagnetic flow in a rotating channel in the presence of inclined magnetic field

1017 Book Review

I Software Survey Section

NUMBER 9

F. Dai and **M. M. Khonsari** 1019 On the solution of a lubrication problem with particulate solids

M. Shoukry, S. Nair and **S. Kalpakjian** 1035 Effect of shear deformation on the dynamic plastic bending of metallic plates during normal penetration

L. Restuccia and **B. Maruszewski** 1053 Diffusion and dislocation influences on the dynamics of elastic bodies

J. C. Misra, S. C. Samanta and **A. K. Chakrabarti** 1065 Magneto-thermoelastic interaction in an aelotropic solid cylinder subjected to a ramp-type heating

Gabriele Guerriero 1077 Global solutions and L^1-stability to a nonlinear evolution problem in the diffusion of the particles of a mixture

Cristian Făciu 1085 Energy estimates in three-dimensional rate-type semi-linear viscoelasticity with non-convex free energy

Cristian Făciu 1103 Numerical aspects in modelling phase transitions by rate-type constitutive equations

A. F. Ghaleb 1121 A phenomenological model for elastic superconductors

Tomasz Lewiński and **Józef Joachim Telega** 1129 Homogenization and effective properties of plates weakened by partially penetrating fissures: asymptotic analysis

Pierre Hillion 1157 Spinor form of electromagnetism in nonhomogeneous media

Da Yu Tzou 1167 The resonance phenomenon in thermal waves

1179 Corrigenda

I Software Survey Section

NUMBER 10

S. Chiriţă and **S. Rionero** 1181 Lagrange identity in linear viscoelasticity

Salvador Godoy and **Shigeji Fujita**	1201	Theory of diffusion and electric conduction due to quantum tunneling along the *c*-axis of layered materials
J. C. Misra, S. C. Samanta and **A. K. Chakrabarti**	1209	Magnetothermomechanical interaction in an aeolotropic viscoelastic cylinder permeated by a magnetic field subjected to a periodic loading
C. V. Massalas	1217	A note on magnetothermoelastic interactions
L. M. Brock and **J.-S. Wu**	1231	Transient emission of screw dislocations from a dynamically-loaded interface crack
R. L. Batra and **Bigyani Jena**	1245	Flow of a Casson fluid in a slightly curved tube
G. Vaidyanathan, R. Sekar and **R. Balasubramanian**	1259	Ferroconvective instability of fluids saturating a porous medium
C. Erkman and **I. T. Gürgöze**	1269	Thermostatics of an infinite mixture of an elastic solid and a fluid containing a spherical thermal inclusion
E. Smith	1277	The magnitudes of the various contributions to the *J* integral for a stationary crack
E. Smith	1283	The criterion for expressing the plastic contribution to the *J* integral in terms of two eta factors
F. M. Hady and **F. S. Ibrahim**	1289	The laminar mixed convective plume along the vertical surface in a transverse magnetic field
T. Kondo and **H. Sekine**	1295	The crack kinking at and going through the bonded interface of two semi-infinite anisotropic media under longitudinal shear stresses
H. Pascal	1307	Gravity flow of a non-Newtonian fluid sheet on an inclined plane
T. Gobinath and **R. C. Batra**	1315	A steady state axisymmetric penetration problem for rigid/perfectly plastic materials
		Letters in Applied and Engineering Sciences
A. Trad	1333	A surface Helmholtz integral system for a sound radiation by an elastic body. A nonuniqueness theorem
	I	Software Survey Section

NUMBER 11

G. A. Rogerson and **N. H. Scott**	1337	Wave propagation in exceptional directions in multi-constrained elastic solids
Pallath Chandran	1349	Acoustic waves at the interface of a gaseous and dusty media
P. Glaister	1357	Solutions of a two-dimensional dam break problem

M. Errafiy and **R. Kh. Zeytounian**	1363	The Bénard problem for deep convection: routes to chaos
V. N. Nikolaevsky, A. S. Kuznetsov and **E. N. Bellendir**	1375	Mathematical dilatancy theory and conditions at strong discontinuities
R. C. Batra and **Aslam Adam**	1391	Effect of viscoplastic flow rules on steady state penetration of thermoviscoplastic targets
C. W. Li and **J. H. W. Lee**	1409	Line momentum source in cross-flow
J. Tweed and **G. Melrose**	1419	The out of plane shear problem for an infinite sheet with a staggered array of pairs of cracks
V. I. Fabrikant	1425	Neumann problem for an annular disk
Giovanni Cimatti	1433	Bifurcation for the "corona" problem
S. Parhi and **G. Nath**	1439	A sufficient criterion for Rayleigh–Taylor instability of incompressible viscous three-layer flow
James P. Thomas	1451	The modeling of open mass continuum mixtures
M. Aron	1471	On a minimum property in nonlinear elasticity
M. S. Alam Sarker and **Newal Kishore**	1479	Decay of MHD turbulence before the final period
Debendranath Sahoo	1487	Gauge theory of vortices in a fluid
S. K. Malik and **M. Singh**	1493	Stability of a magnetic fluid jet
	1501	Announcements
	I	Software Survey Section

NUMBER 12

J. C. Misra, S. C. Samanta, A. K. Chakrabarti and **Subhas C. Misra**	1505	Magnetothermoelastic interaction in an infinite elastic continuum with a cylindrical hole subjected to ramp-type heating
A. Cemal Eringen	1515	Memory-dependent orientable nonlocal micropolar fluids
Sanda Cleja-Tigoiu	1531	Elasto-viscoplastic constitutive equations for rock-type materials (finite deformation)
Victor Tigoiu	1545	The flow of a viscoelastic fluid between two parallel plates with heat transfer
A. Siginer	1557	Oscillating flow of a simple fluid in a pipe

D. A. Eftaxiopoulos and **C. Atkinson**	1569	Crack tip stress singularities and dislocation interactions with anisotropic viscoelastic bimaterial interfaces
P. J. Janele, A. Mioduchowski and **J. B. Haddow**	1585	A note on finite dynamic deformation of concentric cylinders
Yishi Duan and **Shengli Zhang**	1593	Topological current structure of dislocations in the 4-dimensional gauge field theory of dislocation and disclination continuum
H. S. Paul and **M. Venkatesan**	1601	Wave propagation in a piezoelectric bone with a cylindrical cavity of arbitrary shape
C. A. Tan and **C. D. Mote Jr**	1609	Pressure and flow in fluid films constrained between translating and vibrating flexible surfaces
J. B. Cardoso and **J. S. Arora**	1627	Shape design sensitivity analysis of field problems
Nicolas Charalambakis and **Elias C. Aifantis**	1639	Thermoviscoplastic shear instability and higher order strain gradients
M. Şinasi Göğüş	1651	The influence of a vibrating plate on the flow between parallel plates of a binary mixture
Ziliang Zhou	1661	Creep and recovery of nonlinear viscoelastic materials of the differential type
M. S. Ganagi and **A. V. Gopalakrishna**	1673	Weak discontinuities in relativistic magnetohydrodynamics in the presence of dissipative mechanisms
Jinyan Fang and **Chuanjun Yan**	1689	A new method for determination of particle sizes and positions
	1695	Announcement
	I	Software Survey Section